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RELEASABLE TO FWMAF AND RVNAF  
ACCIDENTAL HERBICIDE DAMAGE

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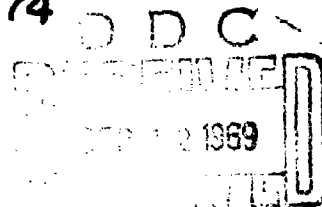
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# VIETNAM

LESSONS LEARNED No. 74

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HEADQUARTERS  
UNITED STATES MILITARY ASSISTANCE COMMAND, VIETNAM  
APO 96222

MACJ3-053

15 September 1969

SUBJECT: Vietnam Lessons Learned No. 74: Accidental Herbicide Damage

SEE DISTRIBUTION

1. Attached for information is a Lessons Learned from recent experiences in the Republic of Vietnam (RVN).
2. This information may be of value for direct application to training or to reinforce, review, or revise existing doctrine based on experiences in the RVN.
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J.F. HARRIS  
Major, USA  
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VIETNAM LESSONS LEARNED NO 74

## ACCIDENTAL HERBICIDE DAMAGE

1. (U-FOUO) GENERAL. Herbicides have been used successfully in the support of tactical operations in the Republic of Vietnam (RVN) since 1961. As it is the case with any weapon or support system herbicides can be misused. This misuse, coupled with careless handling and disposition of used containers, can cause extensive damage to crops and desirable vegetation.

2. (U) PURPOSE. The purpose of this Lessons Learned is to cite two recent examples of accidental herbicide damage and to review the measures that can be taken to eliminate the causes of the damage.

3. (U-FOUO) BACKGROUND.

a. Objectives of the Herbicide Program. The enemy in the RVN uses the natural concealment of the jungle and grasses to a considerable tactical and logistical advantage. The herbicide program has two objectives:

- (1) Defoliation to remove natural concealment and expose the enemy, making him vulnerable to our reconnaissance and firepower, and providing better security to our own facilities and lines of communications (LOC).
- (2) Destruction of the enemy's crops to weaken the enemy by restricting his food supply and forcing a manpower diversion to food cultivation, procurement, and transportation.

b. Herbicides Used. A herbicide is any preparation used to inhibit the growth of plants, or to remove their leaves prematurely so as to enhance visual reconnaissance. There are three types of herbicides in use in the RVN. They are all liquids and, to avoid technical terms, each one has been given a color designation: ORANGE, WHITE, or BLUE. For identification of contents, a 4-inch band of the particular color appears on the 55-gallon drums in which herbicides are contained (see figure 1, page 2). These are issued through the Army of the Republic of Vietnam (ARVN) supply channels.

- (1) ORANGE is used against broadleaf plants. After spraying, plants show discoloration in seven to ten days and defoliation is at its peak effectiveness after four to six weeks. It will remain effective for about 12 months.

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Identifying Band  
WHITE, ORANGE or  
BLUE



FIGURE 1

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- (2) WHITE is similar to ORANGE but is slower acting and takes from 10 to 14 days for discoloration and six to eight weeks for effective defoliation.
  - (3) BLUE is used against narrow leaf vegetation, such as rice, bamboo, banana, or grass. Discoloration occurs within 24 hours and leaves wilt in two to four days.
  - c. Toxicity and Persistence. All these herbicides present low risks to humans and animals. They have been widely used in the US for more than 20 years on food and other crops, rangeland, and forests. No special precautions are needed by air or ground crews and friendly troops are often sprayed without ill effects. None of the herbicides is persistent in soil, and areas must be resprayed periodically to kill regrowth, if the tactical situation requires it.
  - d. Methods of Application. By far, most herbicides are sprayed by 1000-gallon spray apparatus mounted in U.S. Air Force aircraft. Herbicides are also applied using a variety of other devices on helicopters and ground equipment.
4. (U-FOUO) ACCIDENTAL DAMAGE. The following recent examples are cited as being typical accidental herbicide damage. Their effects, causes, and remedies will be presented.
- a. In early 1969 large numbers of shade trees in Da Nang appeared to be dead or dying. Garden plots in the city were also damaged. There were strong indications that the damage was caused by herbicides either by drift or leakage from spraying aircraft, or from herbicide drums brought into the city. Investigation ruled out the aircraft leakage or drifting spray. In every case of damage however, drums which were considered empty were either present or had been moved through the area. Herbicides are pumped from 55-gallon drums into the spray aircraft. The method of pumping leaves a residue of two to three gallons in each drum. In the case at hand, the bungs were generally not replaced (or at best loosely replaced) and the drums were loaded onto trucks, hauled into Da Nang (often dripping herbicide along the route), and sold to commercial concerns. The herbicide that remained in the drums after sale was usually drained onto the ground at numerous points throughout the city. Even if completely

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drained at the air base, the vapors from the drums can cause serious plant damage. Cleaning the drums is difficult, if not impossible, as some herbicides have an oily base and the small bung hole limits access to the inside of the drum. These drums should be kept under control and not released or reused indiscriminately.

- (2) Similar herbicide supply operations were carried out at Nha Trang, Bien Hoa, Phu Cat, and Saigon. Damage to crops was also noticed at these locations.

b. Xuan Loc District of Long Khanh Province.

- (1) In June 1969 the Long Khanh Province Chief and his senior advisor became concerned about what appeared to be herbicide damage to crops along route QL 20 north of Xuan Loc. They suspected spray drift from a UC-123 target to the west. Investigation along the highway as far north as Tuc Trung revealed that very few crops, other than beans which are highly sensitive, were affected. It was noted that the intensity of damage was greatest in and near the towns and gradually decreased with distance away from the towns. This is not characteristic of herbicide drift.
- (2) Further investigation of the towns' perimeter defenses, outposts and gun emplacements revealed the presence of large stocks of WHITE and some ORANGE for ground spray operations. These installations, located on high ground overlooking the towns, contained leaking drums and many undrained "empty" drums. Leaking and "empty" drums were being moved along route QL 20. The usual wind speeds in this area at this time of the year are too high for safe herbicide operations.
- (3) In Xuan Loc itself, one of the major compounds contained a large stock of WHITE in which there were several leaking drums and many empty drums. Extensive damage to trees and other vegetation was noticed. Many empty drums were seen around many private houses in each of the towns.
- (4) It was therefore concluded that the herbicide damage in Xuan Loc and north from it along route QL 20 was probably caused by improper hand spraying techniques and improper handling and storage of herbicide drums.

5. (U-FOUO) LESSONS LEARNED.

- a. Extreme care must be exercised when handling herbicides. Unless properly controlled, herbicides can cause extensive damage to crops, trees, and other vegetation.

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- b. The number of storage and mixing points should be kept at a minimum. These should be isolated from cultivated and desirable vegetation.
- c. Where defoliation by hand spray must be done near crops or other desirable vegetation, contaminated JP-4 or diesel fuel should be used without the addition of the herbicide.
- d. Ground spray with herbicides should be closely controlled and done only where essential.
- e. For ground spraying, ORANGE should be mixed with 10 to 20 parts of JP-4 or diesel fuel (contaminated fuel is acceptable); WHITE should be mixed with 50 parts of clear water; and BLUE should be mixed with 20 parts of clear water.
- f. Spraying should be done only between dawn and about 1000 hours, at ambient temperatures under 30°C (86°F) and in calm or extremely low wind conditions. These temperature inversion conditions will result in the most effective use of herbicide and cause minimum drift.
- g. Herbicide drums should be completely drained at the storage site, rinsed with large amounts of water, resealed, and returned to supply points. (Rinse water must also be controlled).
- h. At supply points, the empty drums should have holes punched in both top and bottom and their further use should be limited to construction of revetments and other military defensive positions. (A recommended alternate use is for the construction of flame field expedients as outlined in Chapter 6 of Dept of the Army Field Manual 20-33, "Combat Flame Operations". For this use, holes must not be punched in the drums but care must be exercised in handling them.)
- i. A warning, such as "Danger - Vapor from contents of these drums can damage plants and trees", should be posted at storage sites and stenciled in Vietnamese on each drum.
- j. Detailed instructions on the proper use of herbicides, handling of leaking drums, draining and cleaning of drums after use, and drum disposal procedures should be disseminated to all users of herbicides.

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EFFECTS OF DEFOLIANTS ON A COCONUT GROVE

FIGURE 2

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3. Handout FB 600-640.2, USA Chemical Center and School, undated, "Herbicides".
4. Report on the Herbicide Policy Review, American Embassy, Saigon, 28 August 1968.
5. 7AF Pamphlet No. 55-1, HQ, Seventh Air Force, 20 March 1968, "Seventh Air Force In-Country Tactical Air Operations Handbook".
6. DOA Working Paper 69/18, Directorate of Tactical Analysis, HQ, Seventh Air Force, undated, "Herbicide - Defoliation Program 7AF 1967-Feb 1969" (Informal Paper).
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